

## 2.7 Dhara Vikas: Creating water security through spring-shed development in Sikkim

*Dhara Vikas is an innovative programme to revive and maintain drying springs in the north-eastern state of Sikkim. A robust climate adaptation strategy for drought-prone districts, Dhara Vikas (meaning, spring-shed development) is helping to alleviate the problem of rural water scarcity by reducing surface runoff of rainwater and allowing more water to percolate down to recharge underground aquifers, which, in turn, ensures increased discharge from springs. Besides its significant impact on crop patterns and yields, the programme has also worked on developing a village spring atlas and a water source atlas for the state. Water access to the population through this initiative has also led to improved sanitation practices.*

### Rationale

The adverse impact of climate change on rainfall threatens the delicate, holistic balance that once stimulated the Himalayan ecosystem. Sikkim, too, has witnessed a change in rainfall pattern, including increased intensity of rainfall, reduction in temporal spread, and a significant fall in winter rainfall<sup>1</sup>. The impact of this change on the lives of the Sikkimese people gained wide attention during a seminar in 2008, organised by the World Wildlife Fund (WWF) on World Water Day, when a group of local women spoke about the daily drudgery caused by lack of water<sup>2</sup>. The problem of water scarcity was more pronounced in South Sikkim and West Sikkim districts, which fall in rain-shadow areas and receive much less rainfall than other districts. According to the *Sikkim First*, an economic and political journal, about 65,000 (nearly 80%) of the state's rural households depend on springs for drinking water and irrigation. Recognising the urgent need for ensuring water security, the Rural Management and Development Department (RMDD), Government of Sikkim (GoS), conceptualised the Dhara Vikas initiative to revive the state's drying lakes, springs and streams. Estimates suggest that in mountainous terrain less than 15% rainwater percolates down to recharge springs, while the rest is lost as surface water. The core thrust of Dhara Vikas is to catch this runoff water and use it to recharge groundwater sources.

### Objectives

The primary objective of Dhara Vikas is to ensure water security by breaking the cycle of abundance and scarcity of water. It also seeks to enhance the hydrological contribution of the mountainous ecosystem as a water tower for the people, and ensure disaster risk management by reducing landslides and floods.

### Key Stakeholders

This initiative is being run by various departments of government with the support of private institutions. RMDD is the nodal agency for this initiative.

**Figure 1: Key stakeholders in the Dhara Vikas initiative**

#### Nodal Agency

- ❖ Department of Rural Management and Development

#### Government Departments

- ❖ Department of Forest, Environment and Wildlife Management
- ❖ Department of Science and Technology and Climate Change
- ❖ Department of Mines and Geology
- ❖ Indian Space Research Organisation, Department of Space, Bengaluru

#### Private Institutes

- ❖ G.B Pant Institute of Himalayan Environment and Development
- ❖ World Wildlife Fund (India)
- ❖ Gesellschaft für Internationale Zusammenarbeit (India)
- ❖ Peoples' Science Institute, Dehradun
- ❖ Chirag, Nainital
- ❖ Arghyam, Bengaluru
- ❖ Advanced Centre for Water Resources Development and Management (ACWADAM), Pune
- ❖ Tolani Maritime Institute (TMI) India, Sikkim
- ❖ Bhabha Atomic Research Centre, Mumbai

#### Beneficiaries

- ❖ People of South and West districts in Sikkim

<sup>1</sup> Tambe, S., Arrawatia, M. L., Bhutia, N. T. and Swaroop, B. Rapid, cost effective and high resolution assessment of climate-related vulnerability of rural communities of Sikkim Himalaya, India. *Current Science*, 2011, 101(2), 165-173.

<sup>2</sup> This lack of water was primarily due to drying up of lakes and decline in the lean period discharge in streams and springs.



**Image 1: Rural hardship due to water scarcity in Namthang block, South Sikkim**

Source: Rural Management and Development Department, Government of Sikkim

## Implementation Strategy

Increasing occurrence of droughts in South Sikkim and West Sikkim districts, where the springs and streams used to dry up every year between the months of March to May, led the RMDD to launch the Dhara Vikas initiative in 2008. The initiative was launched under the centrally sponsored Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) scheme, with technical support from other government agencies and organisations like WWF - India; People's Science Institute, Dehradun; ACWADAM, Pune, and Arghyam, Bangaluru.

Dhara Vikas aims to revive and maintain the *dhara* (springs) in the South and West districts of Sikkim by using rainwater harvesting, geohydrology and Geographical Information System (GIS) techniques.



**Image 2: Community participation in Namthang block, South Sikkim**

Source: Rural Management and Development Department, Government of Sikkim

The first year of the programme saw the initiation of several capacity building measures for the existing workforce. About 20 programmes were organised in coordination with various NGO stakeholders to develop specialised knowledge and skills in areas such as rainwater harvesting, geohydrology, and spring discharge measurement; use of Global Positioning System (GPS); and laying of contour trenches.



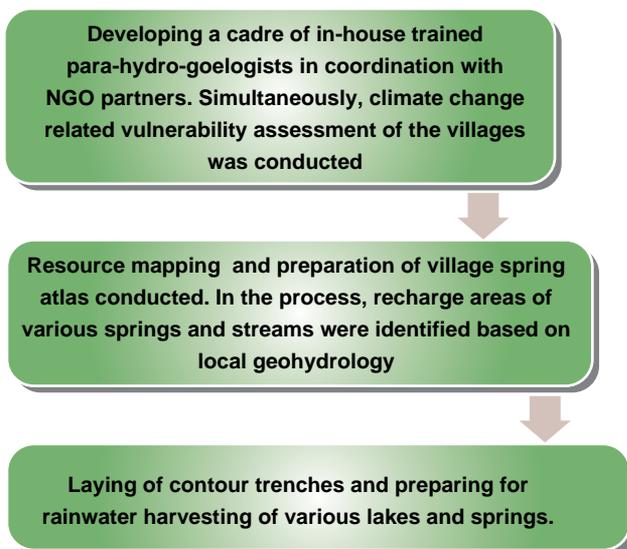
**Image 3: Trenches to trap the runoff rainwater in Namthang block, South Sikkim**

Source: Rural Management and Development Department, Government of Sikkim

Simultaneously, RMDD identified the recharge areas of various springs and streams based on the varying structure, weathering and fracture pattern of rocks. The pilot phase in the year 2010 aimed at reviving the Nagi Lake in South Sikkim district, focussed on digging of trenches and laying of pipes for the recharge of select lakes and springs. The encouraging results of these interventions became evident by 2011, after which the initiative was scaled up in 2012 to cover the South Sikkim and West Sikkim districts. Dhara Vikas enabled a remarkable convergence of expertise from various departments like forest, mines and science and technology, who provided their specialised knowledge on relevant subjects. Activities such as laying of trenches and GI pipes were taken up under the national flagship MGNREGA programme. The major stages of the initiative are depicted in *Figure 2*.

Implementation of the Dhara Vikas initiative has primarily focussed on executing a scientifically robust strategy and generating awareness. The initiative's strategic focus has been on controlling runoff water and increasing its permeation to enhance groundwater recharge. Activities toward this objective include developing springs-sheds,

**Figure 2: Activities initiated by the Dhara Vikas programme**



Source: Rural Management and Development Department, Government of Sikkim, and OneWorld Foundation India, 2014

enhancing hydrological contribution of hill-top forests, reviving lakes to function as recharge structures, expanding minor irrigation networks for paddy cultivation, terracing sloping lands, enhancing water storage infrastructure, developing para-professionals in geohydrology, and carrying out research and documentation.

Dhara Vikas has not required any separate grievance redressal mechanisms. The nature of initiative has been such that it required the committed involvement of villagers, as the problem being addressed impacted all the members of the community. Decisions related to digging of trenches and recharge points were based on principles of geohydrology, which mitigated the potential problems associated with arbitrary decisions. All work-related resolutions have been taken up in the Panchayats and sorted through village-level discussions.

## Pilot project - Nagi Lake

Before the launch of the Dhara Vikas programme, the Nagi Lake in South district of Sikkim had dried up, gradually killing all the springs recharged by it. The pilot project made the lake perennial again and resurrected springs, such as Setikhola, thereby providing water security even during dry months. For details, visit: [www.sikkimsprings.org](http://www.sikkimsprings.org)

Awareness generation has been an important part of Dhara Vikas. As the project was initiated in response to the problem of water scarcity, the villages with the most acute shortage were selected for implementation during the initial phase in 2009. Public awareness was high in the areas where the pilot was conducted. Micro-level planning invariably involved discussion with the local populace. As the initiative was being implemented through MGNREGA, the locals were also kept updated on aspects of implementation.

According to RMDD, the success of the programme, which has revived five lakes and 50 springs, has generated more demand from villages that suffer from similar water scarcity. With the revival of lakes and springs and the increased awareness, villagers in the area have also started constructing water storage tanks. They use the day-time discharge from springs for irrigation, while the night-time discharge is used to fill personal tanks by rotation.

## Resources Utilised

The initiative has made remarkable use of the existing resources by converging the activities of various Departments to ensure effective implementation. NGO partners like WWF provided support in training and assessment studies. More than 20 training programmes have been organised by various NGO partners in collaboration with RMDD. It's estimated that an amount of Rs 2.5 crore has been spent on spring-shed development activities, covering a total area of 400 hectares and resulting in annual groundwater recharge of 900 million litres<sup>3</sup>.

## Impact

**Recharging lakes, reviving springs, reforestation:** Dhara Vikas has created a significant impact by recharging lakes and reviving several springs in Sikkim. As many as 50 springs have been revived, most of them in Kaluk, Rhenock, Ravangla, Sumbuk, Jorethang and Namthang. Further, five lakes, namely Dolling, Deythang, Nagi, Karthok and Datum, were revived by the initiative. It has also led to reforestation of seven hill-top forests at Simkharka, Sadam, Tendong, Maenam, Gerethang, Chakung and Sudunglakha. Overall, at an investment of Rs. 2.5 crore over the last four years, Dhara Vikas has brought about 900 million litres of annual groundwater recharge.

**Creation of a cadre of technical specialists:** Dhara Vikas has also developed seven master trainers as in-house cadre of para-hydrogeologists.

<sup>3</sup> Sikkim First Bureau, web accessed on December 6, 2013, from: <http://sikkimfirst.in/2013/11/10/sikkims-dhara-vikas-initiative-gives-fresh-lease-of-life-to-dying-mountain-springs/>



**Image 4: Recharging lakes by piping surface rainwater flow in Dolling lake, South Sikkim**

Source: Rural Management and Development Department, Government of Sikkim

#### Creation of a village spring atlas and web portal:

Another significant impact of the initiative is the creation of the village spring atlas web portal which provides information on 700 springs, and can be accessed at [www.sikkimsprings.org](http://www.sikkimsprings.org).

**Benefits to agriculture and farming:** Dhara Vikas has made a significant impact on crop patterns and yields. According to Bengaluru-based Indian Institute of Science's assessment report (2013), increased irrigation has encouraged farmers to cultivate new crops such as beans, radish, cauliflower, cabbage and chilly, along with paddy and tomatoes. Many perennial garden fruits, such as guava, banana, orange and litchi, have been cultivated following this initiative. The report also indicates an average of 15% increase in crop yield and 25% increase

### Dhara Vikas' Innovative Approach

- 1 Developed para-geohydrologists to bridge the knowledge gap on geo-hydrology and revival of springs at the village level
- 2 Adopted a landscape-level approach by reviving springs, streams and lakes
- 3 Succeeded as a community-driven initiative that created grassroots demand by successfully carrying out pilot projects on spring-shed development
- 4 Linked with the MGNREGA national scheme for sustainable funding support

in the cultivation of irrigated crops such as paddy, tomato and vegetables.

**Improvements in sanitation:** Another notable impact of the programme is the improvement in sanitation, which was earlier seriously compromised due to water scarcity.

### Key Challenges

As this initiative involved the implementation of a new concept, many lessons were learnt along the way. Trenches for groundwater recharge were initially dug without adherence to geo-hydrological requirements. Some trenches were dug on terraced fields instead of on sloping land, while others were dug without supervision which could ensure maximum trapping of surface runoff, thus making them ineffective. Similarly, many horticulture and forestry activities initially undertaken to improve groundwater recharging did not show any positive outcomes. In time it was realised that trenches and ponds had a greater impact on groundwater recharging and soil moisture than plantations, which lose moisture through evaporation.

In certain locations, the lean period discharge was not recorded, making any conclusive impact assessment impossible. Also, as the programme gathered momentum, its positive effects generated demand for scaling up, which could not be met due to the limited number of trained staff.

### Achievements

**Prime Minister's Award for Excellence in Public Administration (2011–2012)** to Rural Management and Development Department (RMDD), Government of Sikkim

**National Groundwater Augmentation Award (2010–2011)** to WWF-India for technical support to MGNREGA-Dhara Vikas of RMDD; given by the Ministry of Water Resources, Government of India

**T.N. Khoshoo Memorial Award by ATREE (2011)** to Sandeep Tambe, Special Secretary, RMDD, Government of Sikkim, in recognition of his efforts in sustainability and community-based governance of common property resources in Sikkim

**eNorth East Award (2012):** Winner of Village Spring Atlas for conservation of Himalayan springs and adapting to climate change ([www.sikkimsprings.org](http://www.sikkimsprings.org))

## Replicability and Sustainability

The ecologically sound and scientific solution implemented by Dhara Vikas is seen as a highly replicable strategy to tackle the pervasive and persistent problem of water scarcity in mountainous regions. Representatives

### People speak...

#### Experience of a beneficiary



Lendup Lepcha is a beneficiary of the Dhara Vikas project. He considers the improved availability of drinking water to be the biggest benefit of the programme. Like everyone else in the village, Lendup too has his own water tank. He believes that the Panchayat and block development

officers played an important role in ensuring water security, which opened income avenues for the local population. Earlier, he was not able to cultivate in the lean period due to lack of adequate irrigation facilities. After the implementation of Dhara Vikas, the improved availability of water for irrigation has allowed him to diversify into horticulture and vegetable cultivation. Unlike before when he could only cultivate dry crops such as ginger, Lendup now also grows vegetables such as tomato, peas, cabbage and cauliflower. This diversification has increased his income. Lendup believes other parts of the state should also be brought under Dhara Vikas so that many others can benefit from it.

from countries like Nepal and Bhutan, which have a similar topography as Sikkim, as well as from other hilly Indian states, like Arunachal Pradesh and Himachal Pradesh, have visited the state to understand the process of spring-shed development. They plan to implement similar initiatives in their respective geographies.

The sustainability potential of this initiative is also reasonably high, as it taps into plan funds and the MGNREGA scheme and uses infrastructure that already exists within various Departments. Other than the trenches and GI pipes used for groundwater recharging, Dhara Vikas does not demand the creation of any new infrastructure. Once the initial pilot is successful, the impact itself paves the way for Gram Panchayats taking up ownership as well as the responsibility for upkeep and maintenance of the project.

### Conclusion

Dhara Vikas has had a profound impact on the lives of people living in water-scarce areas of Sikkim, and this innovative intervention is set to continue in future. In keeping with its utilisation of latest technology for spring-shed development, Dhara Vikas has initiated an environmental isotopic fingerprinting study of springs in Sikkim, in collaboration with the Bhabha Atomic Research Centre (BARC), to increase knowledge of mountain aquifers. This technique can further strengthen the understanding of recharge areas and pinpoint specific locations for optimal recharge of a spring.

Apart from this, a training handbook is being prepared to illustrate the process of groundwater recharge. Pilots of other water security initiatives, including documentation of village water budget, village recharge areas and ways in which water efficiency can be enhanced are underway.

## Fact Sheet

<b>Theme</b>	<b>Environment</b>
<b>Nodal Implementing Agency</b>	<b>Rural Management and Development Department, Government of Sikkim</b>
<b>Geographical Coverage</b>	<b>South and West Sikkim districts (only mapping covered Sikkim State)</b>
<b>Target Groups</b>	<b>Citizens of Sikkim</b>
<b>Years of Implementation</b>	<b>2009 - Present</b>



An environment management initiative of the Dr. B.R. Ambedkar Institute of Technology promotes environmental conservation and awareness through implementation of rainwater harvesting, effluent treatment and paper recycling that meets about half of the institute campus' water requirement.